Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

June 8, 2012

Project No. 603314-007

Hill, Farrer & Burrill, LLP
One California Plaza - 37th Floor
300 South Grand Avenue
Los Angeles, California 90071-3147

Attention: Mr. Kevin H. Brogan, Partner

Subject: **Initial Response to California Geologic Survey Review Comments**
Fault Rupture Hazard Review
Beverly Hills High School
241 South Moreno Drive
Beverly Hills, California
CGS Application No. 03-CGS0960

As requested, Leighton Consulting, Inc. has prepared this letter to provide our initial response to the California Geologic Survey's (CGS) review of our report of Fault Hazard Assessment for the Beverly Hills High School campus located in western Beverly Hills, California (Leighton, 2012). The review sheet is dated May 21, 2012. A more detailed response to the review comments will be required and this may entail additional analysis and subsurface exploration. We appreciate the reviewer's comments, but believe our data clearly demonstrates the absence of active faulting on the campus. We would like to meet with the reviewers to discuss the review sheet and the best approach to answering their review comments.

Initial Response

We understand that one of the primary concerns of the Beverly Hills Unified School District is the safety of their students. When the West Beverly Hills Lineament (WBHL) was deemed to be an active fault zone and pass through Beverly Hills High School (BHHS) by Metro's consultants, the district was concerned that the fault could pose a serious risk to the students, faculty and staff as well as have an impact on future planned improvements for the school. It is our opinion that our work has shown that

there is no evidence of active faulting onsite and that the immediate safety concern has been addressed. However, our sense is that the reviewers are skeptical of our findings that no active faults associated with the West Beverly Hills Lineament (WBHL) are present on the campus.

While the reviewers agree with our findings in some cases, and indicate some of our interpretations are valid, they are also unconvinced that there are no active faults onsite. As an example, the reviewers state with respect to marker beds mapped in CB-8 and CB-9 that our "interpretation of continuity of the lower sedimentary units, while valid, is not a unique explanation of the data." In other words, a fault could be present but the data does not require it. In our experience a simple geologic explanation is usually the preferred one. In this case CGS seems to be saying that one requiring a fault is the preferred one or at least we have to absolutely rule it out. This seems unusual for a site where no Earthquake Fault Zone has been previously established and where no faults have been previously mapped (other than by Parsons Brinkerhoff, 2011).

There seems to be a bias that the faults mapped by Metro's consultants must be present even though those faults have been inferred based on interpretation of data. Parsons Brinkerhoff (PB) did not actually observe any of the faults they mapped in their study. Instead, they have all been inferred, primarily based on CPT data. We believe our trenches and borings, where we could actually observe the soil, are a much better tool to evaluate the presence or absence of faults on the campus.

Most fault investigations are conducted where known faults are suspected to pass through the site (such as sites located in Earthquake Fault Zones), or where surface features highly suggestive of faulting are observed (lineaments that trend toward or pass through a site). No Earthquake Fault Zone has been established at Beverly Hills High School (BHHS) and the only lineament observed is that described in the literature as the WBHL. It is described in a field trip guidebook (Dolan and Sieh, 1992) as the break in slope between the elevated older alluvial soils to the west and the young alluvial soils to the east. At BBHS the only lineament identified was the slope east of the school which was exposed in Fault Trench FT-2. We trenched across this feature and found no evidence of active faulting.

In almost any other area of southern California, the standard of practice for our investigation (where no Earthquake Fault Zone is established) would have been to excavate a trench across the observed lineament and look for evidence of faulting across the lineament (as we did with FT-2). However, because PB (in an unsigned report) has inferred a 550-foot wide zone of faulting through the high school, and because of the district's safety concern, we conducted an extensive study that we

believe has far exceeded that standard. We excavated trenches across 90 percent of the width of the campus (not just the lineament), and showed very good continuity of units across the campus in two separate profiles of closely spaced borings. The reviewers note that our interpretations of continuity of the units are valid. However, they also state: "The borings and CPTs performed by the consultant are helpful in determining larger vertical offsets, but are insufficient to preclude smaller scale vertical offsets or larger horizontal offsets due to strike slip faulting." We believe we are being held to a significantly higher standard for our investigation simply because PB has interpreted faults through the site.

This conclusion presents us with a very difficult task of having to prove a negative. These same methods (using Borings and CPT's, yet with wider spacing) were used by PB to infer that faults are present. If our methods are not good enough to preclude them (although our interpretation of no faults was considered a valid interpretation), how can PB's data be relied upon to so clearly define them as to put them on a map, establish a 550-foot wide zone and call them active? Based on the review comments, it seems we will have to actually observe (trench) the entire site to prove that PB's inferred faults are not present. That is a difficult task in a developed site.

Our data has already shown PB's inferred faults are not present as mapped. PB described the WBHL at the campus as a 550-foot wide zone of faulting. In all our trenches across 90 percent of the campus we found no active faults. We found no evidence for a wide zone of faulting. The reviewers have indicated that "considering the uncertainty of potential fault trends, the trench locations and transect lines are too far apart to provide continuous coverage." It is not just their trend that is uncertain; the very presence of the faults mapped by PB is unknown and is only inferred.

The reviewers express concern that differences in elevation of the marker beds observed in our borings are suggestive of faulting. For example, they state that "between borings CB-3 and CB-4 an elevation drop of approximately six to seven feet is noted between paleosols (i.e. Bt horizons), the base of a unique varved sequence and the San Pedro Formation contact." We note a 6-foot elevation drop in two mapped paleosols, a 5-foot drop in the contact with the top of the San Pedro Formation (Qsp_1), and 4.5-foot drop in elevation of the contact between Qsp_1 and Qsp_2. Interestingly, the amount of elevation difference decreases with depth. If faulting had occurred, we would expect the elevation difference to be uniform (if all the units were present when faulting first took place), or we would expect the elevation difference to increase with depth (with the older units experiencing more offset). Instead the elevation difference decreases with depth.

There are also elevation differences in the units observed in Borings CB-1, CB-2 and CB-3. The contact between Qsp_1 and Qsp_2 drops 7 feet between CB-1 and CB-3. Trench FT-1 is located above these units and the reviewers agree that no faults were present in FT-1. Similarly the contact between Qsp_1 and Qsp_2 drops 7.5 feet between CB-5 and CB-7. No evidence of faulting is observed in Trench FT-2 above these units. We agree the units show slight fall to the east, but there is no reason to suspect faulting as the cause between CB-3 and CB-4 just because there is no trench between these two borings. Indeed, the continuity of the otherwise exposed geologic section and its consistently gentle east dip on both sides requires that there not be a fault there or the stratigraphy would be disrupted.

The reviewers also question whether the soil fractures observed in Trench FT-2 (and FT-3) may be fault controlled and question whether the soil microfabric analysis conducted is conclusive. While we did not sample every fracture, the ones that we did sample were the most major, and did show layers that were offset. They also extended from the top to bottom of the trench. We did not sample those that died out vertically up or down. Figure 1 shows photographs taken during sample collection at Station 1+46.5 (north wall) and at station on 1+50 on the south wall. Obvious offset gravel layers are shown in the photographs.

The reviewers suggest that lateral slip may have occurred across these fractures. Lateral slip should have resulted in shearing of the clays in the fractures, while pure extension might not have. Again, significant shearing was not observed in the microfabric analysis. Instead the clays were observed to be translocated (not sheared) and the secondary fabric was estimated to be tens of thousands to hundreds of thousands of years old. Even if the fractures were a result of fault movement (instead of slope movement during seismic shaking as we believe), the fractures have been demonstrated to be pre-Holocene in age and are thus not active.

During the field visits with the reviewers to observe the core samples, there was much discussion regarding the difficulty in recognizing pure strike slip faulting within the cores if the units were near horizontal. In the review sheet, the reviewers ask us to demonstrate an unbroken horizontal stratigraphic sequence below fractures and tilted ped surfaces in Trench FT-2. But the units are not horizontal neither in the trench nor in the subsurface. They dip to the east and (as the reviewers point out) there is a significant elevation difference to the north. There is about 100 feet of elevation difference between the bedrock contact in our Boring CB-1 on Transect A and PB's Boring T4-B10 on Transect B (a horizontal distance of about 720 feet).

Our trenches cross many of PB's (2011b) mapped faults. However, the reviewers note that our trenching may not be adequate because this "assumes the trend of the suggested faults is well understood." We did not make this assumption; PB makes the statement that: "Clear evidence for a wide zone of faulting is observed along the WBHL. Multiple lines of evidence from three different east-west transects show faulting, forming a zone on the order of 550 feet." They have defined the zone and indicated the evidence of faulting was "clear." But apparently it was not very "clear" as we could not reproduce their findings independently and upon review of our data (they have collected no new data), PB has changed their fault interpretations (PB, 2012). In particular, they now infer a fault with significant offset extending from just west of BHHS (west of our CB-1 along Transect A) northward between our Boring CB-13 and PB's T4-B10 (along Transect B). They suggested up to 350 feet of right lateral offset along this fault. They make this interpretation based on offset elevation contours along the top of the San Pedro Formation. With about 100 feet of elevation difference between Transect A and B, 350 feet of right lateral offset should also show significant apparent vertical offset across this fault (perhaps 40 to 50 feet or more) between CB-13 and T4-B10. However, there is only about 6 feet of elevation difference between the bedrock contact in PB's Boring T4-B10 and our Boring CB-13 (on the other side of PB's inferred fault, see photo Figure 2). There is no evidence for a significant fault between these borings.

The review report (PB, 2012) also shows subsurface elevation contours on the top of the San Pedro Formation east of this fault. These contours (PB's own interpretation) show no offset on the top of the San Pedro Formation for any faults within the Beverly Hills High School Campus (east of the "new" fault, see Figure 3). If the top of this unit is not offset, on what basis has PB mapped these faults?

As noted this "new" fault is just offsite (about 25 feet) to the east of CB-1 and FT-1. If this fault is present as inferred it must be a distinct feature and not a wide zone of faulting as no evidence of faulting (or even fractures) was observed in FT-1.

We again state that we have found no evidence of active faulting at BHHS. We would like to meet with the reviewers to discuss their review comments and develop a plan to address their specific concerns. We will prepare a more detailed response to the CGS review comments, but this letter presents our initial response.

Closure

We appreciate the opportunity to be of service to Beverly Hills Unified School District. If you have any questions, please contact the undersigned directly at the e-mail addresses and phone extensions listed below, at 866-LEIGHTON.

Respectfully submitted,

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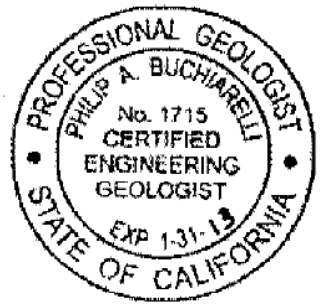

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JAR/PB/lr

Attachments: References
Figure 1 - Photographs During Soil Microfabric Sample Collection
Figure 2 - Photographs of Qsp Contact, CB-13 and PB's T4-B10
Figure 3 - Annotated copy of PB's Figure 2A (2012).

Distribution: (6) Addressee
(2) California Geologic Survey

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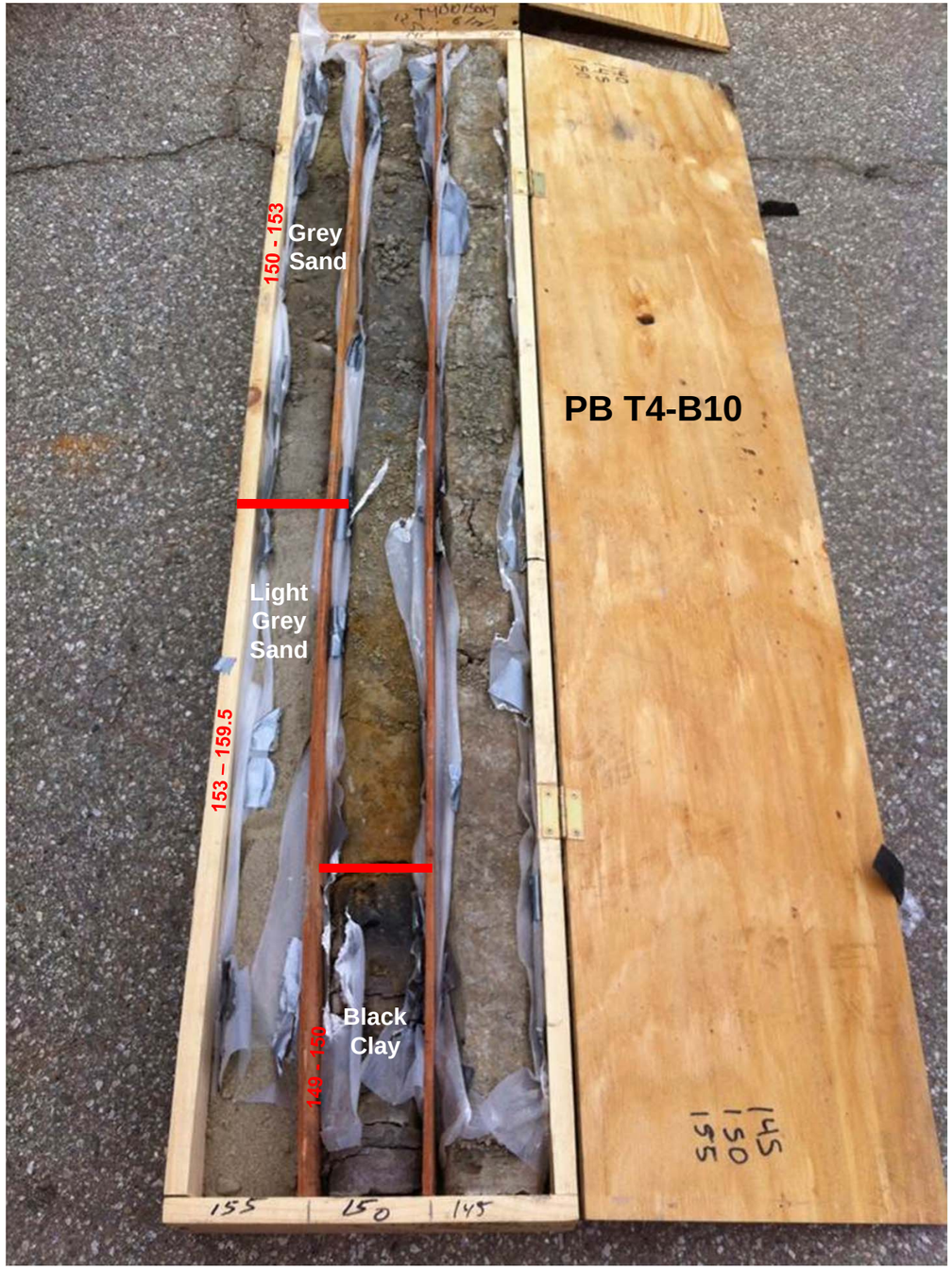
Station 1+46.5
North Wall
before sample collection

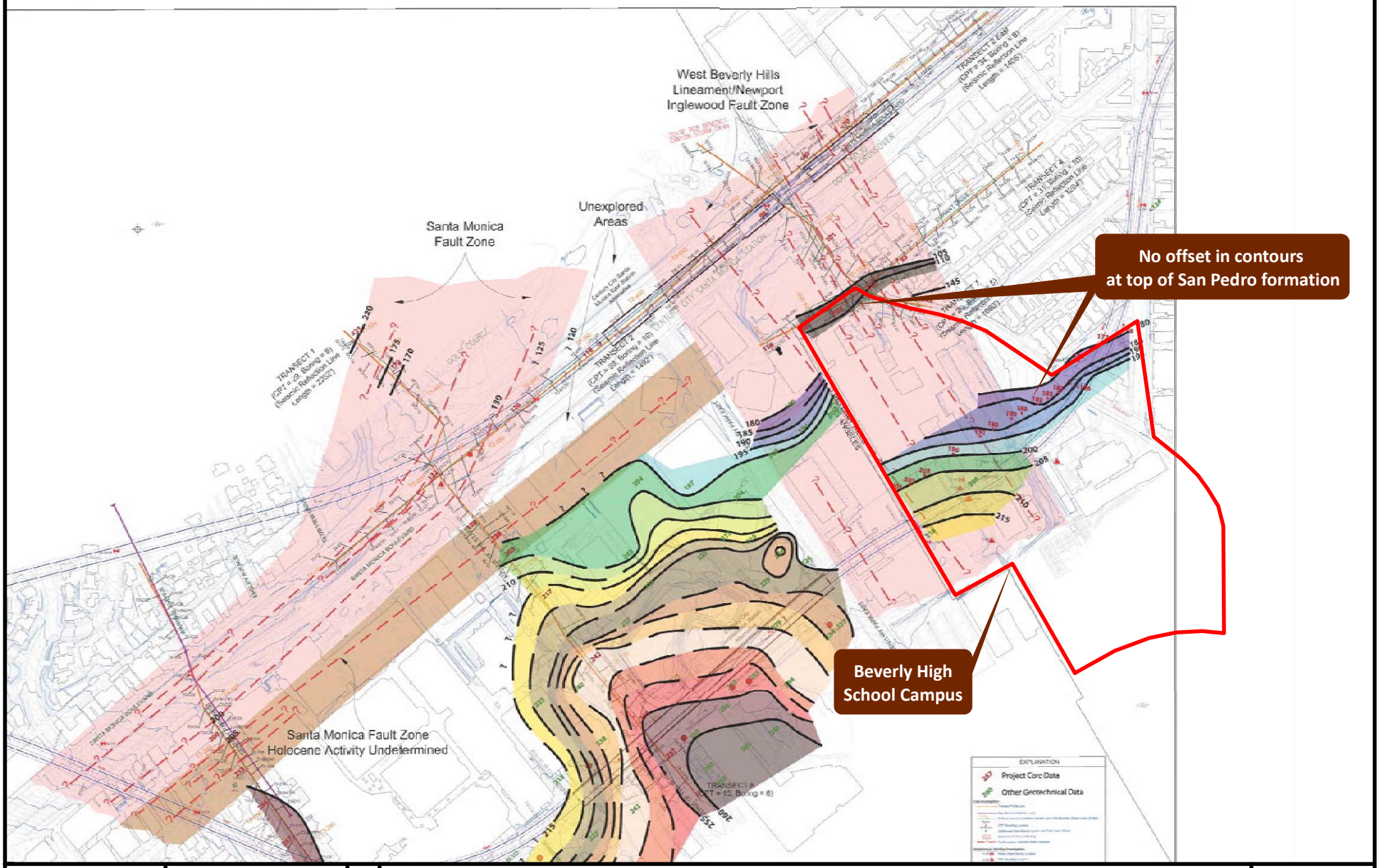
Station 1+46.5
North Wall
during sample collection

Station 1+50
South Wall
Offset gravel

Project: 603144-007	Photographs during Soil Microfabric Sample Collection	Figure 1
Eng/Geol: PB	Beverly Hills High School, Beverly Hills, California	Leighton
Date: June 2012		



Project: 603144-007	Leighton CB-13 and PB T4-B10 **Qsp Contact** Beverly Hills High School, Beverly Hills, California	Figure 2
Eng/Geol: PB		Leighton
Date: June 2012		



Project: 603314-007	Eng/Geol: PB
Scale: 1 " = 500 '	Date: June, 2012

Source: PB, 2012, Figure 2A
Thematic Info: Leighton
Author: (kmanchikanti)

0 500 1,000 Feet

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Beverly Hills High School

Beverly Hills, California

Figure 3

Leighton

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